U.S. Department of Transportation
Federal Aviation Administration

DRAFT Advisory Circular

Subject: UNMANNED AIR VEHICLE PILOT QUALIFICATION AND TRAINING **Date:** XX/XX/96 **Initiated by:** XXX-XXX **AC No:** XX-XX **Change:**

1. PURPOSE. This advisory circular (AC) provides information and guidance to the aviation community on the qualification and training of pilots of unmanned air vehicles (UAVs).

2. EFFECTIVE DATE. This AC becomes effective [*insert effective date*].

3. RELATED FEDERAL AVIATION REGULATIONS (FAR).

a. Title 14 Code of Federal Regulations (14 CFR) part 1, Definitions and abbreviations.

b. 14 CFR part 61, Certification: Pilots and flight instructors.

c. 14 CFR part 91, General operating and flight rules.

d. 14 CFR part 141, Pilot schools.

e. 14 CFR part 143, Ground instructors.

4. RELATED READING MATERIAL.

a. AC XX-XX, Unmanned Air Vehicle Design Criteria, dated [*insert date*].

b. AC XX-XX, Unmanned Air Vehicle Maintenance, dated [*insert date*].

c. AC XX-XX, Unmanned Air Vehicle Operations, dated [*insert date*].

d. Aeronautical Information Manual (AIM), U.S. Department of Transportation, Federal Aviation Administration.

5. BACKGROUND.

a. Although extensive experience has been gained with UAVs operated by the Department of Defense (DoD), there is a lack of data pertaining to the civilian use of UAVs.

b. The prospect of significant market growth in civil UAV operations has prompted the Federal Aviation Administration (FAA) and the aerospace industry to establish recommendations for UAV pilot qualification and training. Although these recommendations are not regulatory, the FAA believes that voluntary adoption of these recommendations by the segments of the aerospace industry involved in UAV operation will ensure that appropriate safety levels are maintained and that public trust in UAV operations is strengthened. Additionally, this gradual approach toward implementation of UAV pilot certification and training criteria should promote the technological development of civil UAV operations without putting an unreasonable economic burden on the industry.

c. The task of establishing a set of acceptable UAV qualification and training criteria is complicated by the wide variety of UAV sizes and types envisioned for production, the diversity of possible UAV operations, and consequently, uncertainty as to what pilot knowledge and skills may be generally needed.

d. Although there may be significant operational differences between UAVs and other air vehicles, in order for UAVs to share the same airspace and ATC services, the FAA recommends that UAV pilots also should hold certain minimum qualifications of existing FAA pilot certificates.

e. The data collected and experience gained in future civil UAV operations will provide the FAA and the aerospace industry with the expertise necessary to determine the best methods of controlling and integrating this new activity into the National Airspace System (NAS).

6. DEFINITIONS. The following terms have the meaning listed when used in this AC.

a. Air Vehicle Control Station. A flight deck on the ground without external flight environment cues used for the control of a UAV.

b. Autonomous Operation. A preprogrammed, automated flight profile that does not require human intervention for normal operation.

c. Close Supervision of an Experienced UAV Pilot. A situation in which a UAV student operates the UAV, but a UAV pilot who meets the qualification criteria of this AC and can monitor all of the UAV instruments can immediately take control of the UAV at any time deemed necessary by the pilot in command. The supervising pilot should have operated or acted as pilot in command of the particular make and model of UAV for a minimum of 15 hours under IFR if the supervision is of internal pilot operations, or a minimum of 25 takeoffs and landings if the supervision is of external pilot operations.

d. External Pilot. A UAV pilot who, in the absence of full automatic launch and/or recovery systems, visually controls the UAV flight path, generally during takeoff and landing, from a site that provides direct visual contact with the UAV.

e. Internal Pilot. A UAV pilot who operates the UAV from a site that does not necessarily provide direct visual contact with the UAV. The internal pilot normally operates the UAV by means of commands sent to the UAV by radio link. Vehicle status and navigation information is received from the UAV also via radio link. An internal pilot also may consist of a hardware and/or a software system on board the UAV capable of providing flight path control inputs to the vehicle based on real-time environmental, system health/status, or tasking inputs; however, a ground-based internal pilot is responsible for monitoring autonomous operations.

f. Pilot In Command. For UAVs, the pilot in command is defined as the designated pilot within the controlling air vehicle control station tasked with overall responsibility for operation and safety of the UAV in flight. This may be the pilot physically sitting at the control console or the designated mission commander. In cases where UAV control is passed from one control station to another, change in pilot in command occurs upon acknowledgment of successful completion of control authority transfer by the new controlling station. The external pilot, if used, should be the pilot in command while the UAV is under his or her control for launch or recovery.

g. Propulsion System. A system comprised of those components necessary to ensure the safe propulsion of the UAV.

h. Unmanned Air Vehicle (UAV). An air vehicle that does not carry a human operator, and is capable of flight beyond a visual line of sight under remote or autonomous control for civil (non-DoD) purposes. A UAV is considered nonexpendable if engaged in operations other than hazardous or oceanic meteorological observation operations.

7. GENERAL. The recommendations contained in this AC apply to all UAV operations conducted within the NAS, other than those conducted solely within restricted areas or warning areas.

8. UAV PILOT QUALIFICATIONS.

a. Medical Qualifications. At a minimum, a third-class medical certificate should be held by a UAV pilot. Because the air vehicle control station is not subjected to rapid changes in atmospheric pressure, physical ailments due to barometric sensitivity as anticipated in FAR § 67.17(c) may be waived with the appropriate marking on the medical certificate "UAV operation only."

b. Certification. Prior to operating a UAV without the close supervision of an experienced UAV pilot, the pilot of a UAV should possess at least a private pilot certificate, with an appropriate category rating as follows:

(1) An airplane rating, for the operation of a fixed-wing UAV.

(2) A rotorcraft rating, for the operation of a rotary-wing UAV.

c. Initial Training.

(1) Equivalent Level of Training. Prior to operating a UAV without the close supervision of an experienced UAV pilot, the pilot of a UAV should, at a minimum, have the training and experience in the safe operation of the specific UAV being operated equivalent to that required for the pilot of an aircraft having similar performance characteristics under similar air traffic and weather conditions.

(2) Ground Instruction. A person wishing to operate a UAV should, prior to operating a UAV without the close supervision of an experienced UAV pilot, receive ground instruction that takes into account the inherent differences between UAVs and manned aircraft, as indicated by the UAV manufacturer. Instruction should cover these differences between UAVs and manned aircraft in at least the following subjects:

(i) Aerodynamics and principles of flight;

(ii) Structures, flight controls, electrical systems, navigation systems, propulsion systems, communications systems, and data link description and principles;

(iii) Flight instruments, displays, and interpretation.

(iv) UAV performance.

(v) Weather limitations.

(vi) Navigation skills, including dead reckoning, pilotage, and the use of electronic aids to navigation.

(vii) The use of flight information publications.

(3) Aeronautical Knowledge. Prior to operating a UAV without close supervision by an experienced UAV pilot, a person wishing to operate a UAV should complete a test administered by an authorized instructor covering, as a minimum, all of those knowledge areas listed in paragraph (2) above.

(4) Instructional Flight Experience and Proficiency. Persons should be trained on the specific equipment they will operate. A computerized control system is envisioned as the best approach for control of UAVs, and this concept is completely compatible with computer-aided training. Prior to operating a UAV without the close supervision of an experienced UAV pilot, a person wishing to operate a UAV should receive any supplemental training that is recommended by the UAV manufacturer and agreed upon by an FAA Inspector trained in UAV operations. Training supplemental to that received under part 61 may be expected particularly with respect to FAR §§ 61.99, 61.107, and 61.109 (in the case of a fixed-wing UAV); and §§ 61.100 and 61.113 (for a rotary wing UAV), because range and duration of flight may be significantly different from manned aircraft. The prospective UAV pilot should have logged instruction from an authorized instructor, and the applicant's logbook should contain an endorsement by an authorized instructor who has found the applicant competent to perform each of those operations listed in FAR § 61.107, as appropriate for that make and model of UAV. Appropriate operations should include those operations the prospective pilot can be reasonably expected to perform for that make and model, including normal, abnormal, and emergency procedures.

(5) Check Flight. Prior to operating a UAV without the close supervision of an experienced UAV pilot, a person wishing to operate a UAV should complete a check flight, including both an oral component and a practical component. This check flight should be administered by a competent and experienced UAV pilot, and should be in the format of an FAA-approved private pilot practical test. The person administering this check flight should seek to determine whether the person taking the check flight is sufficiently skilled and knowledgeable to operate a UAV in a safe manner and without posing a safety risk to other aircraft, persons, or property.

d. Recency of Experience. Each UAV operator should establish its own recency of experience requirements for its UAV pilots. At a minimum, the following criteria are recommended in order for a person to operate a UAV without the close supervision of an experienced UAV pilot:

(1) External pilots should have performed three actual takeoffs and landings to a full stop in the make and model of UAV within the previous 90 days.

(2) Internal pilots should have performed 6 hours as the crewmember of a UAV operating IFR within the previous 180 days. At least 2 of the 6 hours should be performed while operating a UAV in actual flight.

9. UAV PILOT-IN-COMMAND CERTIFICATION AND TRAINING.

a. Certification. Other than when operating in the capacity of an external pilot, the pilot in command of a UAV should possess at least a commercial pilot certificate with an instrument rating in the appropriate aircraft category rating as follows:

(1) An airplane rating, for the command of a fixed-wing UAV.

(2) A rotorcraft rating, for the command of a rotary-wing UAV.

b. Initial Training. A UAV pilot in command should meet all of the initial training criteria listed for UAV pilots. [*Additional criteria, if any, to be determined following further guidance.*]

c. Recency of Experience. In order to act as pilot in command of a UAV, other than in the capacity of external pilot, a person should meet all of the recency of experience criteria listed in paragraph 8.d.(2) above for UAV internal pilots. [*Additional criteria, if any, to be determined following further guidance.*]

10. UAV GROUND AND FLIGHT INSTRUCTORS.

a. General. Whenever practicable, UAV ground and flight instruction should be provided by FAA-certificated ground and flight instructors who have significant UAV operating experience.

b. UAV Ground Instructor. Ground instruction should be provided by a certificated ground instructor under FAR part 143 who is endorsed by the UAV manufacturer(s) as being competent to

teach those aspects peculiar to the UAV system. For some very basic UAV systems, it may be appropriate that no more than a certificated ground instructor be required to train the UAV pilot in preparation for the check flight.

c. UAV Flight Instructor. Flight instruction should be provided by a certificated flight instructor under FAR part 61 who is endorsed by the UAV manufacturer as being competent to teach those aspects peculiar to the UAV system.

11. ADDITIONAL GUIDANCE. Operators of UAV designs and operators of UAVs engaged in applications that, because of mission requirements or hazardous conditions, cannot comply with the suggested training criteria specified in this AC, should contact the nearest FAA Regional Office for further information and guidance.

12. COMMENTS INVITED. Comments regarding this publication should be directed to:

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